

***Calandrinia butcherensis* and *C. rubrisabulosa* (Portulacaceae), new species from the Midwest of Western Australia**

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Abstract

Obbens, F.J. *Calandrinia butcherensis* and *C. rubrisabulosa* (Portulacaceae), new species from the Midwest of Western Australia. *Nuytsia* 24: 207–214 (2014). Two new species of *Calandrinia* Kunth, sect. *Pseudodianthoideae* Poelln. are described: *C. butcherensis* Obbens and *C. rubrisabulosa* Obbens. Images of the taxa and a distribution map are provided.

Introduction

The current paper is the latest in a series (Obbens 2011, 2012, 2014) describing new species of *Calandrinia* Kunth. from Western Australia. *Calandrinia butcherensis* Obbens and *C. rubrisabulosa* Obbens, described below, are respectively a geographically restricted and a habitat specific species from sect. *Pseudodianthoideae* Poelln.

Methods

Methods used are the same as those described in Obbens (2011). It is worth noting, however, that *C. rubrisabulosa* has variable plant architecture and in some plants it is difficult to differentiate between stems and scapes. The term ‘collicula’ (pl. ‘colliculi’) is herein used to describe the individual domed protuberances characteristic of a colliculate seed surface pattern commonly seen in many *Calandrinia* species.

SEM images were produced at the Biodiversity Conservation Centre, Botanic Gardens and Parks Authority (BGPA), using a NeoScope JCM-5000 scanning electron microscope, operating at 10Kv and working distance of 45 mm. Seeds were coated with gold before scanning. Images were subsequently processed using Photoshop 2.0. The bioregions referred to in describing species distributions and as also indicated on the map are from *Interim Biogeographical Regionalisation for Australia (IBRA) Version 7.0* (Department of the Environment 2013).

Taxonomy

Calandrinia butcherensis Obbens, *sp. nov.*

Type: Yalardy Station, Western Australia [precise locality withheld for conservation reasons], 12 October 2011, *F. Obbens & G. Marsh* FO 14/11 (*holo:* PERTH 08336474 & 08336482; *iso:* AD, CANB, MEL).

Calandrinia sp. Butchers Track (L.S.J. Sweedman 6608), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au> [accessed February 2014].

Annual herbs; semi-erect to erect, 100–400 mm tall, 50–380 mm wide, glabrous, the root system comprising a weak to moderately-sized taproot with several laterals. *Basal leaves* fleshy, narrowly linear to narrowly obovate, occasionally broader, 5.2–52.3 mm long, 1.1–5.1 mm wide, most with a shallow medial groove on adaxial surface, green to reddish grey-brown. *Stems* usually 1–10, 18–145 mm long, radiating from base. *Stem leaves* fleshy, narrowly linear to narrowly obovate, occasionally broader, 3.3–25 mm long, 0.7–3.8 mm wide, alternate, occasionally sub-opposite or as leaf clusters at stem ends. *Scapes* 40–105 mm long, often with a few or more residual leaves and/or bracts scattered along the scape, occasionally once-branched. *Inflorescence axis* 45–260 mm long, bare except for 3 or more \pm scarious bracts, mostly opposite particularly on the upper axis, generally forming a loose cyme. *Inflorescence axis bracts* appressed to \pm spreading, triangular, 2.3–6.3 mm long, 1.2–3.9 mm wide, with a long-acuminate apex. *Pedicels* 5–21 mm long, to 30 mm long in fruit, moderately to strongly reflexed. *Flowers* 25–30 mm diam. *Sepals* thick, ovate to broadly ovate, 3.7–6.8 mm long, 1.2–5.9 mm wide, free to base, mucronate, with a strong midvein and several other prominent veins and some reticulation. *Petals* 5, mid- to dark pink, obovate to broadly obovate with a shallowly depressed apex, 8.5–17.2 mm long, 6.9–12.2 mm wide, free to base. *Stamens* 33–77 in 2 or 3 ill-defined rows with longer inner and shorter outer series; filaments free, 1.2–4.0 mm long, attached to the top of basal ring beneath ovary, papillose on lower basal adaxial portion; anthers oblong to broadly oblong in outline, 0.5–1 mm long, 0.5–0.7 mm wide, versatile, extrorse, dehiscent longitudinally. *Ovary* obovoid, 1.0–1.9 mm diam., brown. *Stigmata* 3, squat-triangular, lengthening, spreading somewhat, linear to narrowly triangular at maturity, 0.7–2.4 mm long, free to base, with a dense covering of long stigma trichomes. *Capsule* ovoid to broadly ovoid, 3.7–6.4 mm long, 2.3–3.6 mm wide, the apex obtuse; usually level with the sepals occasionally slightly shorter or longer; valves 3, splitting from apex to base with age. *Seeds* 48–123, brown-tan, dull, sometimes semi-glossy, sub-reniform to reniform, 0.5–0.65 mm long, 0.45–0.6 mm wide, 0.3–0.45 mm thick, surface strongly patterned and often micro-punctate overall, in plan view the surface with distinctly domed and somewhat elongated colliculi, the apex of each dome generally not central within collicula, sometimes the colliculi more elongated with a smaller dome or papilla centrally while in dorsal view the colliculi are always elongated each with a broad, raised papilla generally at one end (in closely spaced rows and forming ridge-like structures). (Figures 1; 2)

Diagnostic features. *Calandrinia butcherensis* has distinctive dull seeds due in part to the micro-punctate ‘frosting’. The seed surface pattern is also distinctive consisting of elongated and closely packed colliculi, each with a relatively large, fingertip-like dome. The domes may be occasionally smaller, like broad, raised papillae, and be more centrally positioned within collicula.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 21 Aug. 2008, *F. Obbens, F. Hort & J. Hort* FO 29/08 (PERTH, 2 sheets); 28 Sep. 2005, *L.S.J. Sweedman* 6608 (PERTH); 10 Oct. 2011, *L.S.J. Sweedman* 8330 (KPBG).

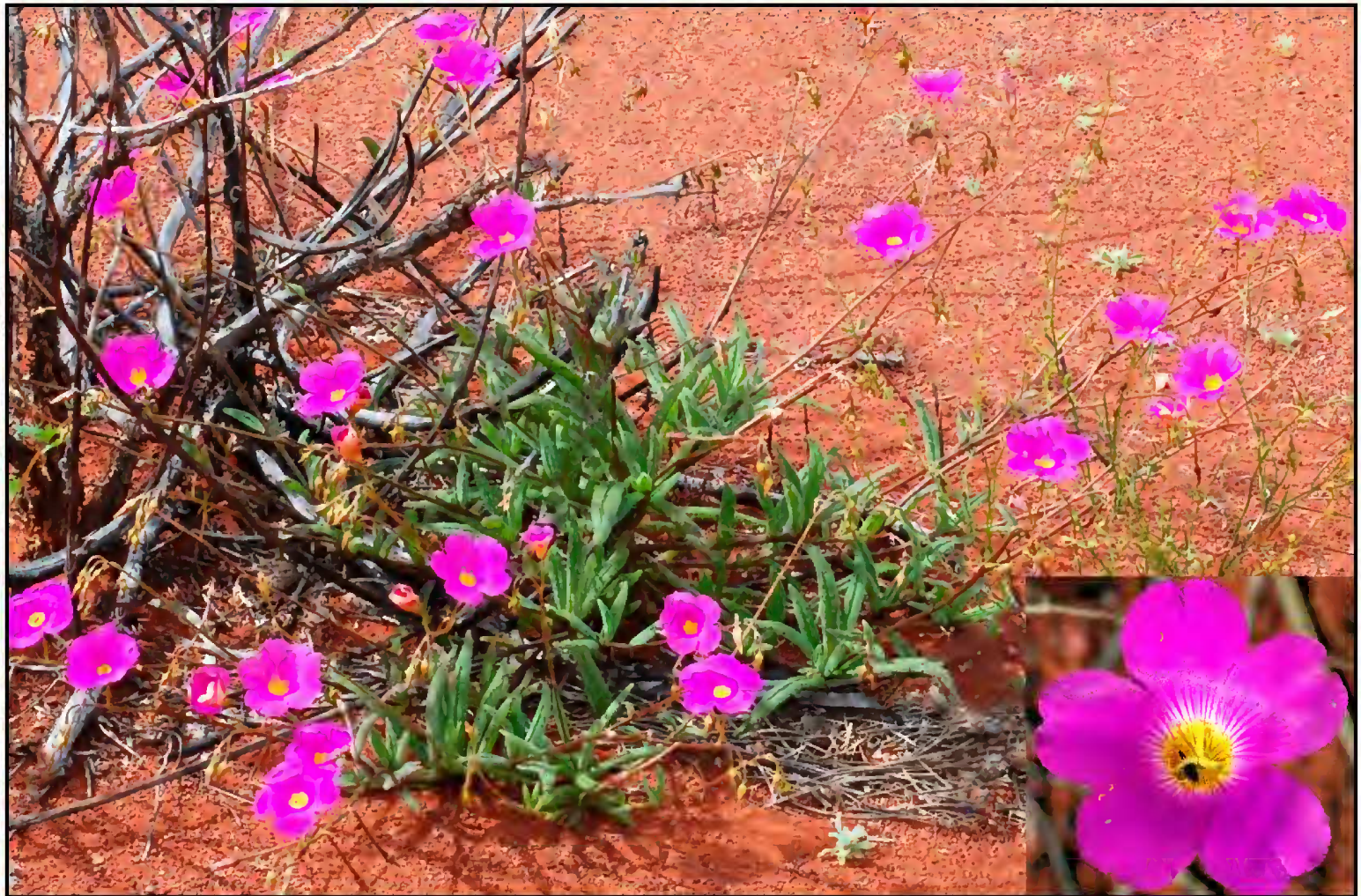


Figure 1. *Calandrinia butcherensis* whole plant and insert of close-up of flower, F. Obbens, F. Hort & J. Hort FO 29/08, PERTH. Images by F. & J. Hort.

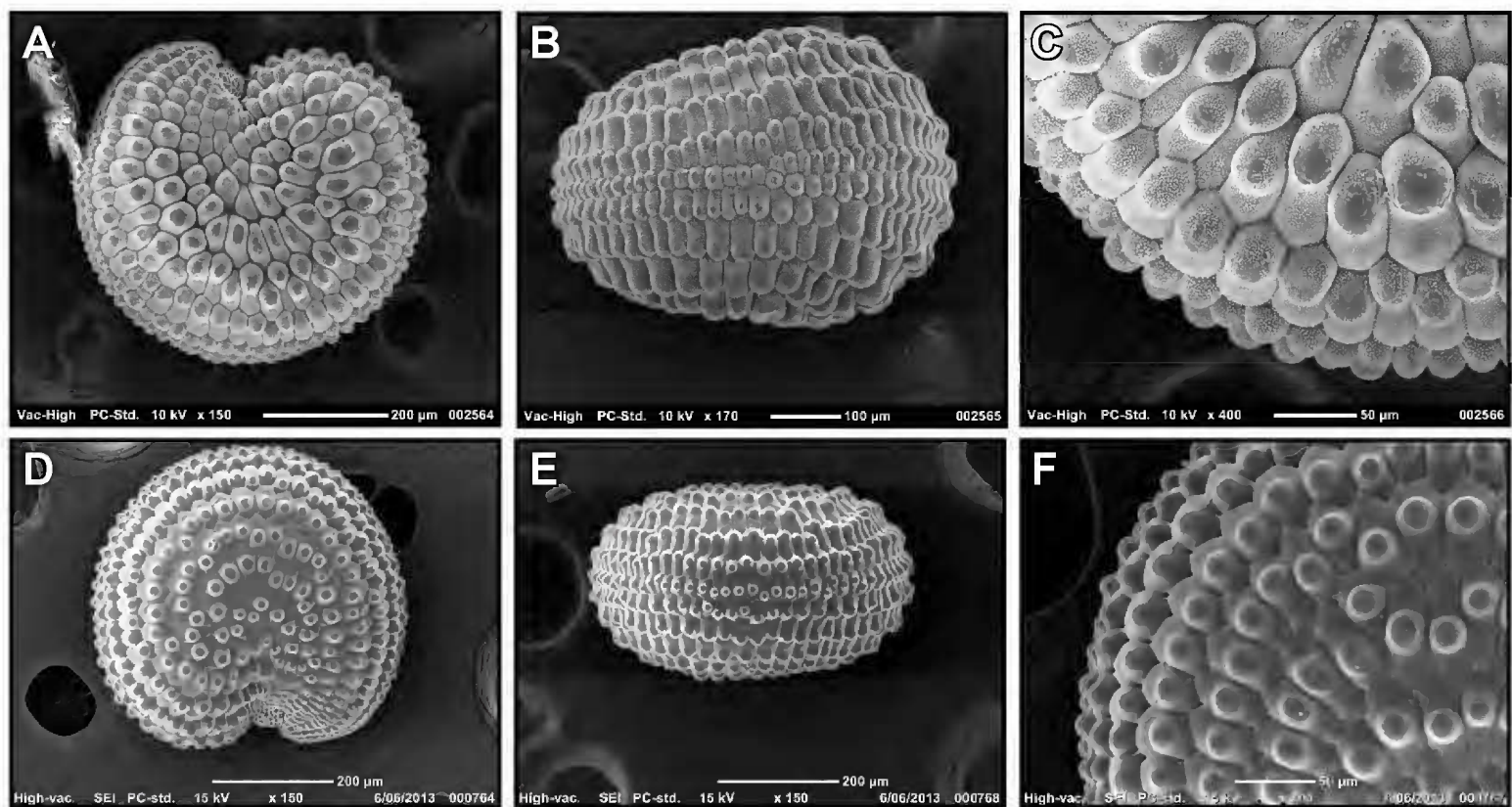


Figure 2. *Calandrinia butcherensis* seeds. A – plan view; B – dorsal view; C – surface pattern at higher magnification; D – plan view, E – dorsal view, F – surface pattern at higher magnification. Images A–C from type specimen, F. Obbens & G. Marsh FO 14/11, PERTH; images D–F from southern-most population, L. Sweedman 8330, KPBG.

Phenology. Flowers and fruits from mid-August to early October.

Distribution and habitat. The occurrence of *C. butcherensis* extends approximately 125 km from the Byro–Woodleigh Road in the north (Carnarvon bioregion) southwards to south of the Murchison settlement (in the western part of the Murchison bioregion) (Figure 3).

The few existing collections of *C. butcherensis* have generally been found in similar landforms and habitats. Three locations were in undulating sandplain with the fourth occurring on the slopes of a small dune, while all grew in red sand or red sandy loam. *Calandrinia butcherensis* has so far only been collected from tall, open shrubland over open shrubs and herbs with *Acacia ramulosa* and *A. aneura* s. lat. often present. Other associated species include *Ptilotus polystachus*, *P. obovatus*, *Grevillea ?levis*, *Goodenia* sp., *Stylobasium spathulatum*, *Erodium cygnorum*, *Monachather paradoxus*, *Senna* sp., *Aristida holathera* and numerous annuals.

Conservation status. Recently listed as Priority One under Department of Parks and Wildlife Conservation Codes for Western Australian Flora as *Calandrinia* sp. Butchers Track (L.S.J. Sweedman 6608) (Western Australian Herbarium 1998–). *Calandrinia butcherensis* is probably under-collected throughout its narrow range. There are three PERTH collections, two of which are from almost the same location on Butchers Track, while the fourth, in KPBG (Kings Park and Botanic Garden herbarium), is the southern-most collection. Future targeted surveys could extend the range of *C. butcherensis*, but a precautionary conservation status is recommended as most of the present distribution lies within pastoral lease. It is possible that *C. butcherensis* occurs within the nearby and extensive Muggon Conservation Park.

Etymology. The epithet is derived from the name Butchers Track where it was first collected.

Notes. L. Sweedman made the first collection of *C. butcherensis* under the name *C. polyandra* Benth. *Calandrinia butcherensis* is only superficially like *C. polyandra* in being a medium to large-sized plant with five petals and three stigmata, like several other calandrinias in sect. *Pseudodianthoideae*, but the seeds of these two species are very different. *Calandrinia polyandra* has slightly glossy, brown seeds with a moderately colliculate surface pattern of shallowly domed colliculi. In contrast, *C. butcherensis* has dull, brown-tan seeds, with a coarser surface pattern of distinctly domed colliculi and also elongated colliculi with rows of broad papillae on the dorsal surface. *Calandrinia rubrisabulosa* is suggested here as a possible close relative to *C. butcherensis* because both have a somewhat similar seed surface pattern and micro-punctate ‘frosting’ on their seeds (see Figures 2; 4). However, the southern-most collection of *C. butcherensis* has seeds without micro-punctate ‘frosting’, has semi-glossy rather than dull seeds and also has a seed surface pattern which differs somewhat to the other collections (Figure 2 D–F), but in general characteristics matches this taxon. To date, with so few specimens studied to determine the variability of *C. butcherensis*, the above collection still appears best placed here unless further research proves otherwise.

***Calandrinia rubrisabulosa* Obbens, sp. nov.**

Type: east-south-east of Carnarvon townsite, Western Australia [precise locality withheld for conservation purposes], 14 October 2011, F. Obbens & G. Marsh FO 20/11 (*holo:* PERTH; *iso:* AD, CANB, MEL).

Calandrinia sp. Red sand dunes (F. Obbens & G. Marsh FO 20/11), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au> [accessed February 2014].

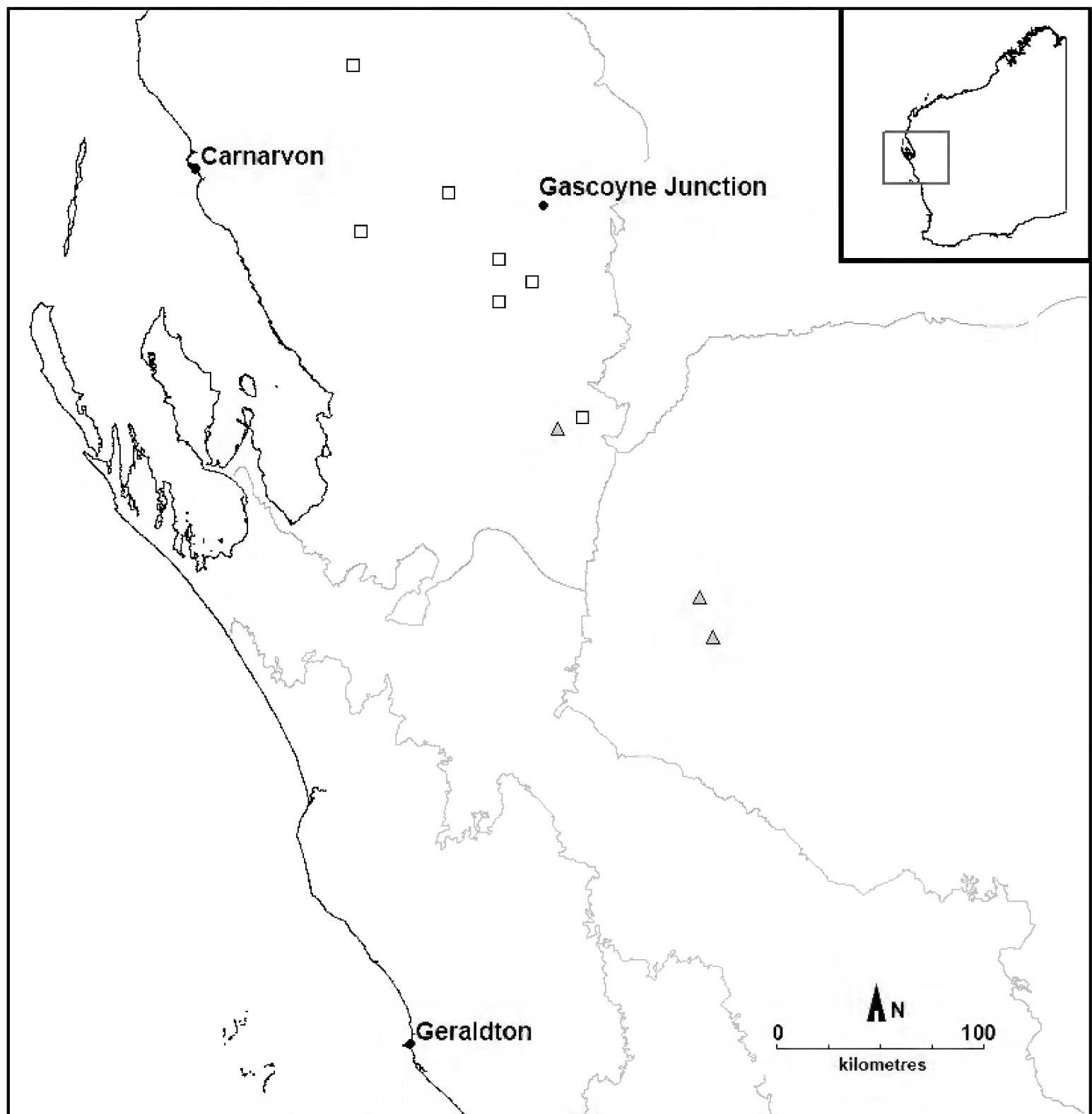


Figure 3. Distribution of *Calandrinia butcherensis* △ and *C. rubrisabulosa* □ in Western Australia.

Annual herbs; semi-erect to erect, 50–360 mm tall, 20–450 mm wide, glabrous, the root system comprising a moderately-sized taproot with several laterals. *Basal leaves* fleshy, narrowly linear to linear, 11–42 mm long, 1–5.4 mm wide, with a strong medial groove on adaxial surface and a raised midvein abaxially, surface tuberculate overall, pale reddish white to light reddish brown. *Stems* usually 1–8, 12–190 mm long, radiating from and slightly thickened nearer base, occasionally with a much more thickened central trunk from which several branches originate, often well-spaced. *Stem leaves* fleshy, linear, 4.3–36 mm long, 0.7–4.1 mm wide, alternate or as leaf clusters at stem ends, surface tuberculate overall. *Scapes* 30–200 mm long, often with 1–3 bracts scattered along the scape, occasionally twice-branched or more. *Inflorescence axis* 24–175 mm long, bare except for 3 to several ± scarious bracts, mostly opposite particularly on the upper axis, generally forming a loose cyme. *Inflorescence axis bracts* appressed to ± spreading, triangular, 1.9–6.3 mm long, 0.6–2.5 mm wide, often with a long, thin mucro at the apex. *Pedicels* 7–22.5 mm long, to 32.5 mm long in fruit, moderately to strongly reflexed. *Flowers* 18–34 mm diam. *Sepals* thick, ovate to broadly ovate,

3.6–6 mm long, 2.5–6.1 mm wide, free to base, mucronate, with a relatively prominent midvein and several other less prominent veins. *Petals* 5, mid-pink or darker, obovate to very broadly obovate, apex shallowly emarginate, 8.5–16.5 mm long, 5.5–12 mm wide, free to base. *Stamens* 21–64 either in one row with a few offset stamens for the occasional smaller flower, but usually in 2 or 3 ill-defined rows with longer inner and shorter outer series; filaments free, 1–3.1 mm long, attached to top of basal ring beneath ovary, papillose on lower basal adaxial portion; anthers oblong to broadly oblong in outline, 0.55–0.9 mm long, 0.4–0.65 mm wide, versatile, extrorse, dehiscing longitudinally. *Ovary* spheroid to obovoid, 1.0–1.3 mm diam., brown. *Stigmata* 3, squat-triangular, lengthening, spreading somewhat and becoming narrowly triangular with maturity, 0.85–2.7 mm long, free to base, with a dense covering of stigma trichomes. *Capsule* ovoid to broadly ovoid, 3.5–5.5 mm long, 2–4.5 mm wide, the apex obtuse; usually slightly shorter or longer than the sepals; valves 3, splitting from apex to base with age. *Seeds* 36–125, brown-tan, glossy or varnished in appearance, occasionally duller, sub-reniform, 0.65–0.7 mm long, 0.55–0.65 mm wide, 0.3–0.4 mm thick, surface strongly patterned and micro-punctate overall with colliculate structure consisting of strongly elongated colliculi with a broad raised papilla at one end of each collicula (in widely spaced rows and forming ridge-like structures) both in plan and dorsal view. (Figures 4)

Diagnostic features. *Calandrinia rubrisabulosa* has thickened lower stems, tuberculate leaves and is habitat-restricted to the crests and upper slopes of red sand dunes.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 29 Oct. 1980, H. Demarz 8487 (KPBG); 23 Sep. 2013, F. Obbens & R. Davis FO 16/13 (PERTH); 23 Sep. 2013, F. Obbens & R. Davis FO 17/13 (PERTH); 13 Oct. 2011, F. Obbens & G. Marsh FO 15/11 (PERTH); 14 Oct. 2011, F. Obbens & G. Marsh FO 24/11 (PERTH, 2 sheets); 15 Oct. 2011, F. Obbens & G. Marsh FO 25/11 (PERTH); 11 Aug. 2009, B. Sadlo BS 116 (PERTH).

Phenology. Flowers and fruits from mid-September to late October. The August collection above was of old plant material with some retained seeds from the previous year.

Distribution and habitat. *Calandrinia rubrisabulosa* occurs in the Carnarvon bioregion of the Eremaean Botanical Province. It occurs from the Byro–Woodleigh Road in the south to the Mardathuna Road in the north (Figure 3). *Calandrinia rubrisabulosa* has only been found on the crests down to the mid-slopes of red sand dunes. These dunes also extend further north and south of the above locations so its distribution may increase with targeted collecting.

Open shrubland, often tall, over open shrubs and herbs is the usual habitat of *C. rubrisabulosa* with at least one or two of the following *Acacia* species present as the main overstorey species: *A. ramulosa* var. *linophylla*, *A. murrayana* and *A. anastema*. Other associated species include *Crotalaria cunninghamii*, *Ptilotus polystachyus*, *Senna artemisioides* subsp. *helmsii*, *Pileanthus* sp., *Stylobasium spathulatum*, *Eremophila* sp., *Quoya loxocarya*, *Eriachne aristidea*, *Aristida holathera*, *Waitzia acuminata* and other annuals.

Conservation status. Recently listed as Priority Three under Department of Parks and Wildlife Conservation Codes for Western Australian Flora as *Calandrinia* sp. Red sand dunes (F. Obbens & G. Marsh FO 20/11) (Western Australian Herbarium 1998–). There are seven PERTH collections and one KPBG collection of *C. rubrisabulosa* and it is probably under-collected over its fairly substantial distribution. Even though this species is habitat specific, red sand dunes abound in this area and further surveying will almost certainly increase the distribution. It is probable that it may occur in the Pimbee

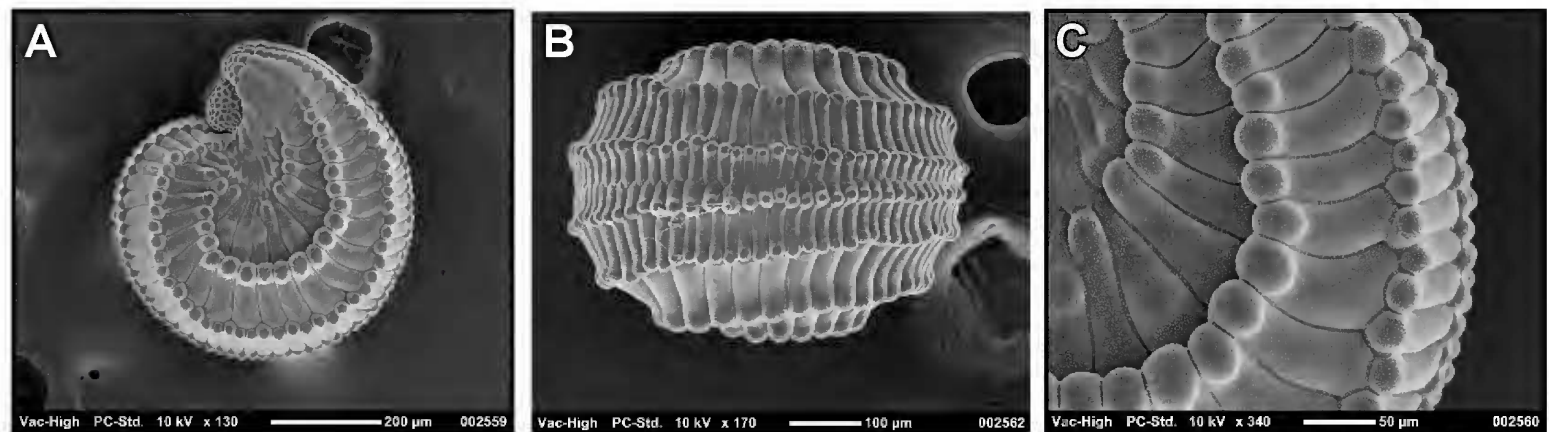


Figure 4. *Calandrinia rubrisabulosa* seed. A – plan view; B – dorsal view; C – surface pattern at higher magnification. Images from type specimen, F. Obbens & G. Marsh FO 20/11, PERTH.

Conservation Park or in western parts of the Kennedy Range National Park, while the remaining distribution is all within pastoral lease.

Etymology. The epithet is derived from the Latin *rubri-* (red-) and *sabulosum* (sandy place), in reference to the species' specific habitat.

Notes. *Calandrinia rubrisabulosa* was first collected in 1980 by H. Demarz and was labelled '*Calandrinia* sp.'. Most *C. rubrisabulosa* plants have slightly thickened stems nearer the base, but a few plants display an excessively thickened central trunk from which other stems originate (often well-spaced). *Calandrinia rubrisabulosa*, like *C. butcherensis*, can be placed amongst a group of other *Calandrinia* species in sect. *Pseudodianthoideae* that are superficially like *C. polyandra*, but the thickened lower stems, tuberculate leaves and specific habitat preference of this species distinguish it from many of the above. Also, as previously mentioned, *C. rubrisabulosa* is probably related to *C. butcherensis* (refer to *Notes* under that species). It is worth noting that *C. rubrisabulosa* only occurs on red sand dunes while widespread species such as *C. polyandra* and *C. remota* J.M.Black have also been recorded from this habitat among many others. One collection of *C. butcherensis* was also found on a small red sand dune.

Acknowledgements

Thanks to Mike Hislop, Bob Chinnock, Terry Macfarlane and Ryonen Butcher for reviewing earlier drafts of this paper. Also thanks to Matthew and Russell Barrett from the Botanic Gardens and Parks Authority for helping with the SEM seed images and Luke Sweedman (BGPA) for supplying field and collection information. Once again, thanks to Fred and Jean Hort for fieldwork support for *Calandrinia butcherensis* and for providing the excellent image for Figure 1. My thanks to Gilbert Marsh, Rob Davis and Steve Toole for fieldwork support for *C. rubrisabulosa*. And finally, thanks to the many colleagues and volunteers at the Western Australian Herbarium (Department of Parks and Wildlife) who have helped in some way with this voluntary project and for the use of facilities at that institution.

References

- Department of the Environment (2013). *Australia's bioregions (IBRA), IBRA7*. Commonwealth of Australia. <http://www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra#ibra> [accessed February 2014].
- Obbens, F.J. (2011). Five new species of *Calandrinia* (Portulacaceae) from Western Australia with additional information on morphological observations. *Nuytsia* 21(1): 1–23.

- Obbens, F.J. (2012). Three new species of *Calandrinia* (Portulacaceae) from the Eremaean and South West Botanical Provinces of Western Australia. *Nytsia* 22(6): 351–362.
- Obbens, F.J. (2014). Two new species of *Calandrinia* (Portulacaceae) from southern Western Australia. *Nytsia* 24: 37–43.
- Western Australian Herbarium (1998–). *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. <http://florabase.dpaw.wa.gov.au/> [accessed February 2014].